

## COMPUTER-IMPLEMENTED VEHICLE REPAIR ANALYSIS SYSTEM

### BACKGROUND OF THE INVENTION

#### 5    1. Field of the Invention

*Sub B1*  
The present invention relates generally to a computer-implemented vehicle processing facility analysis system, more particularly, to a networked and distributed computer-implemented vehicle repair facility analysis system.

#### *Sub B2* Background and Summary of the Invention

*Sub B3*  
Vehicle repair shops handle a large volume of vehicles. Vehicles remain many days within the shops since the repair process has many time consuming steps. For example in a typical collision repair process, vehicles undergo a vehicle disassembly step, frame repair step, metal repair step, preparation step, painting step, reassembly step, and testing step. Delays invariably arise from a number of sources. Exemplary delay sources include the incorrect parts being delivered or an insurance company not quickly processing a vehicle collision claim.

*Sub B4*  
Due to the large volume that repair shops handle, repair shop managers find it difficult to correctly diagnose what delays occur enough times to warrant correction.

20    The delays that occur most frequently might be able to be diagnosed. However, delays that occur less frequently escape detection and correction.

Not only is the diagnosis of vehicle delays problematic, but it is difficult for a shop owner to obtain in a relatively straightforward way a comprehensive view of how the owner's shop is performing in terms of facility potential, profit potential and other factors relative to other shops, let alone know how it is performing relative to the top vehicle repair shops. Business analysis software packages exist, but are typically not directed to as many specifics (e.g., cycle time analysis, facility shift, and other factors) of a vehicle repair shop, and therefore are less complete. A non-limiting specific example includes the amount of paint used by technicians in the repair process. Typical business analysis software packages are not directed to analyzing the usage of paint and how such usage compares with other shops.

The present invention overcomes the aforementioned disadvantages as well as other disadvantages. In accordance with the teachings of the present invention, a computer-implemented method and apparatus is provided for tracking a vehicle during a vehicle-related multi-step process. A vehicle identifier is received for uniquely identifying a vehicle. A delay reason is received for why the vehicle was delayed during at least one of the multi-step processes. An association is stored among the delay reason, the step at which the vehicle delay occurred, and the vehicle identifier. The stored association is used to identify at least one delay reason for the vehicle.

In another embodiment of the present invention, a computer-implemented method and apparatus are provided for analyzing a vehicle facility processing business. A business performance data structure is stored in the memory of at least one computer

that is used to summarize business performance data related to the business. A business priority data structure is stored in the computer memory in order to summarize business priorities related to the business. A business projection data structure is stored in the computer memory in order to summarize business projections data related to the business. A production workforce shift profile data structure is stored in the memory in order to summarize production workforce shifts related to the business. A business summary report is generated using the business performance data structure, the business priorities data structure, the business projection data structure, and the workforce shift data structure.

Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are intended for purposes of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

Figure 1 is a system block diagram depicting the computer-implemented vehicle facility repair analysis system;

Figure 2 is a software module data flow diagram depicting the data flow among software modules of the present invention utilized to generate business analysis data;

Figure 3 is a structure chart depicting the web site structure of the present invention;

5        Figure 4 is a computer screen display depicting a succinct recap of business performance, priorities, projections, and production workforce shift report that was generated in accordance with the teachings of the present invention;

Figure 5 is a computer screen display depicting a vehicle tracking and cycle time assessment data processing screen;

Figure 6 is a computer screen display depicting the display of data associated with sales and marketing data;

Figure 7 is a computer screen display depicting the entry and display of detailed data associated with sales and marketing data of Figure 6;

15        Figure 8 is a computer screen display displaying the result of entering data via the computer screen display of Figure 7;

Figure 9 is a computer screen display depicting the display of data that was provided via the computer screen of Figure 7;

20        Figures 10a and 10b are a computer screen display depicting the entry and display of company financial data, owner's priority data, personnel & facility data, and technician workshift data; and

Figure 11 depicts a comparison of the results in selected measures.

5  
ana

Collision repair facility 30 uses computer server 34 to analyze the collision repair facility's performance, priorities, business projections and workforce shifts.

facility's  
facility 3  
compute  
tracked  
present  
facility 3

*Carla Ballana*

*B11*  
based upon the user-provided input data, facility 30 has an opportunity for growth relative to industry guidelines. Module 60 can also indicate to the user how well facility 30 is doing relative to the top 25% of all other collision repair facility shops.

*Sub B12*  
As another non-limiting example, business analysis module 60 receives from computer 42 vehicle repair processing cycle time data. The cycle time data includes not only at what step a vehicle is within the vehicle repair process, but also includes delay reasons and delay time amounts for any delays that have occurred at a step in the repair process. Business analysis module 60 uses the data to identify whether facility 30 has as one of its strengths a relatively fast time to process a vehicle repair.

*Sub B13*  
Business analysis module 60 also can indicate what equipment the facility 30 can use to actualize opportunities or to overcome weaknesses in one or more areas. Business transaction module 64 interacts with business analysis module 60 and user 50 to automate the process of buying for user 50 the equipment that would improve the operations of facility 30. For example, if the business analysis module 60 had identified that facility 30 has a chronic problem of a shortage of movable carts. Business transaction module 64 is used to identify for the user sellers of movable carts. In this manner, the purchase of needed items is automated for the user by the present invention.

*Sub B14*  
In the preferred embodiment of the present invention, a paint supply company provides the present invention to the owner of a collision repair shop. Through use by the owner of module 64 to purchase items, the present invention can recommend

products and services offered by the paint supply company, or products and services offered by companies that have co-branded with the paint supply company. The paint supply company providing the present invention also increases loyalty of the owner to the paint supply company, even if no non-paint items are ordered.

Due to the networked environment in the preferred embodiment of the present invention, multiple collision facilities 56 can use computer server 34 to analyze and to transact business. However, it should be understood that the present invention can also be given to users on a computer storage medium (such as a CD-ROM). The user uses the software to analyze and transact business.

Figure 2 depicts data input and processing performed by business analysis module 60. An user provides customer financial data 80, customer, facility and personnel information 84, customer assessment of priorities 88, and production shift information 89 in order for business analysis module 60 to identify best practices 92, analytical worksheets 96, and forms and policies of the business 100. For example, customer financial data 80 includes refinish labor sales and other data items depicted in Figures 10a and 10b shown by reference numeral 80. Customer, facility and personnel information 84 includes number of metal stall including frame and other data items depicted in Figures 10a and 10b shown by reference numeral 84. Customer assessment of priorities 88 includes prioritizing financial measures and other items depicted in Figures 10a and 10b shown by reference numeral 88. Production shift

nu  
w

5

[illegible]

chang

20/



results summary web page 120. An example of data entry web page 135 is Figures 10a and 10b.

Figure 4 depicts a 2020 recap which is a succinct presentation by the present invention of how well the collision repair facility is doing. Within the preferred embodiment of the present invention, the following areas or their equivalent are provided: a performance summary 200, a priority summary 204, a projection summary 208, and a production workforce shift profile summary 212.

Performance summary 200 is generated using a performance data structure with the structure depicted within region 216. The business performance data structure includes selected key performance indicators, facility/shop data, industry guidelines, a top 25% indicator, and whether opportunities exist to improve the business. For example, a key performance indicator within data structure 216 includes a production efficiency amount for the facility, industry guidelines, and top 25% indicator. As another example, total gross profit percent is provided for the shop, industry guides, and top 25%. An opportunity in this example has been identified by the present invention that the user's shop has a total gross profit percent of 38.5% which is below the 40.0% industry guideline and well below the top 25% value of 43.5%. An opportunity indicator 220 is generated by the present invention for the user to explicitly show that the user's shop can grow in this area in order to be more competitive relative to other shops. Specific aspects of the shop, such as paint, can be studied and analyzed by the present

invention. For example, monthly paint gallons of waste per paint technician is provided as an indicator for the user to review.

As another example, opportunity indicator 222 is generated by the present invention for the user to explicitly show that based upon the shop's monthly sales and number of staff employees the user's shop can most likely generate additional profits without adding staff.

In the preferred embodiment, performance data structure 216 includes the following indicators: annualized total sales amount, total gross profit percent, production proficiency, production staffing density (main shift), monthly sales per administrative employee, monthly sales per estimator, paint cost per paint hour billed, monthly gallons waste per paint technician, overall customer satisfaction index, and gross profit dollar amount per technician clock hour.

With selected performance indicators such as efficiency and staffing density, the user sees a spectrum of actual values and the shop's position on the spectrum. The user is neither intimidated by group averages that are high nor stifled by a low target. The user will find the performances of real shops at the shop owner's current performance and at any level of performance considered.

For example, Figure 11 depicts a computer screen showing how an user's shop compares to other shops, and not just how the user's shop compares with the top 25% of all shops. In this example, column 237 on Figure 11 depicts that the user's shop is above average for technician production efficiency relative to other shops as shown by

reference numeral 241. Column 239 depicts that the user's shop is below average for stalls per technician (main shift only) as shown by reference numeral 243.

*Sub B2* With reference back to Figure 4, a business priorities data structure is depicted within region 240 in order to store and to display business priority information relevant to the user's shop. The business priorities data structure 240 includes business areas and indicators as to how strong the shop is within the areas. For example, a priority as selected by the user is the financial performance of the shop. Based upon the user's financial input data in this example, the financial performance of the shop is indicated as being relatively weak by the owner as shown by the strength indicator 244. If the user wanted to see the data and the calculation methods by which key performance indicators 200 were generated, the user clicks upon tab 248 to obtain greater detail about the data used to generate the performance indicators 200. In the preferred embodiment, owner priorities data structure 240 includes financial measures, financial performance, sales and marketing, customer satisfaction index, and insurance relations including cycle time, administration (general), administration (parts), production (general), production (refinish), facility (capacity, equipment, layout), and personnel including pay plans and incentives.

*Sub B2* Projections summary 208 uses data structure 250 to handle the projections data associated with the shop. The data structure 250 includes performance factors, sales, gross profit, the additional amount of gross profit that would be generated given a certain level of improvement. Projections data structure 250 allows the user to pose

B22  
"what if" scenarios for assessing how much improvement the user shop would experience given different situations.

Sub B23 For example, the second performance factor in projections data structure 250 is directed to posing a "what if" scenario of what would be the increase in profits with a  
5 10% improvement in production proficiency. Based upon the user's supplied input data, the projections module determines that with the a 10% improvement in production proficiency, the gross profit of the shop would be improved by \$24,000 with sales of \$1,470,000 and a gross profit of \$540,000.

Sub B24 In the preferred embodiment, projections data structure 250 includes the  
10 following performance factors: current performance (annualized), "with 10% improvement in production efficiency" "performance with one additional technician" "with 10% improvement in parts:labor ratio", "with 2% improvement in labor gross profit", "with 2% improvement in parts gross profit" "with 2% improvement in materials gross profit" and "with cumulative impact of all improvements".

Sub B25 The production workforce shift profile summary 212 is generated using a  
15 production workforce data structure 260 that includes main shift only data, main shift plus overtime or Saturday data, main shift and second shift data, and main shift/second shift and Saturday data. Within summary 212, the dark portions 264 that the shop has a main shift plus an overtime shift, while the lighter portions 268 indicate that there is not  
20 a second shift nor a Saturday operations shift. The present invention utilizes within data structure 260 a breakout of the main shift from the other shifts, such as the second shift.

1 In this manner, the present invention is better able to assess facility utilization and  
2 potential for greater facility utilization. By the present invention's identifying main shift  
3 employees separately from second shift employees, the shop owner can not only obtain  
4 a better perspective of the utilization of the facility, but also have a more practical  
5 evaluation of actual stalls per technician for the primary shift.

6 If the user wanted to see how the data was generated or to input new data into  
7 the business analysis module, the user identifies within priority summary section 204  
8 which priority detail needs examination. As an example, if the user wanted to enter in  
9 data for the first time relative to "insurance relations including cycle time", which is the  
10 fifth priority within summary section 204, the user clicks upon tab button 272. Upon  
11 clicking tab button 272, the user is directed to the insurance and cycle time area which  
12 would include the computer screen of Figure 5.

13 Figure 5 depicts a data entry and data display computer screen related to vehicle  
14 tracking and cycle time measurements and assessments. The present invention uses  
15 data structure 304 with the attributes listed in row 300 or equivalents thereof.

16 Cycle time data structure 304 includes a vehicle identifier to uniquely identify a  
17 vehicle that is undergoing a repair process. For example, the vehicle can be identified  
18 by an unique repair number supplied by the shop, a customer name, vehicle brand,  
19 vehicle year, and beginning date of the repair.

20 Data structure 304 also includes the steps which the vehicle is to undergo for  
21 repair. If the repair is due to a vehicle accident which would include a vehicle frame

reconstruction and repainting, then typical repair steps include the vehicle disassembly step, frame repair step, metal repair step, preparation step, painting step, reassembly step, and testing step. Data structure 304 not only tracks what step a vehicle is presently at but also includes whether a vehicle remains at a step for time greater than a predetermined amount. In the preferred embodiment, codes as shown in region 308 are placed at a step where a delay has occurred. For example, a "P1" code is used to indicate that the reason for delay was that there was a delay in delivery of the parts. A number preceding the code indicates the amount of time associated with the delay. In the preferred embodiment, the number indicates the additional days of delay, such as, for example, "2P2" indicates that there was a two day delay at a particular step due to incorrect parts being delivered. Accordingly, if for a vehicle at the frame repair step the code "2P2" appears, this indicates that there was a delay for two days for a vehicle where the frame could not be operated upon due to incorrect parts being delivered.

If a particular shop receives an inordinate amount of code "P2's", then this would indicate that there is a chronic problem of incorrect parts being delivered, possibly for example from a single source for a single brand of vehicle. This delay would adversely affect the strength indicator for cycle time and would also indicate that the problem could be addressed such as by possibly ordering parts from another supply shop for vehicles of that brand.

In the preferred embodiment, the present invention also includes the source category of the parts, such as whether the parts category is an OEM (original equipment

manufacturer) parts category, or an after market parts category, or a salvage parts category, or other types of parts category. Another embodiment includes using additional attributes to store the source category of the parts.

5 *Sub B30* Data structure 304 includes the date upon which the vehicle's repair was completed as well as the final total amount expended to perform the repair. Thus, data structure 304 not only tracks the vehicle through a multi-step process, but also performs cycle time measurement by noting the amount of time of delay. The present invention performs cycle time analysis by providing the reason for the delay.

10 *Sub B31* In the preferred embodiment, when a car enters each step, a symbol such as a "- --" is entered in data structure 304. Each day, all vehicles in the vehicle repair facility are reviewed. If a vehicle has been worked upon for at least five hours, then nothing additionally is noted for the vehicle in data structure 304. However, if less than five hours has been expended for working upon a car, then the reason for the delay as well as the current delay time amount is entered into the appropriate step in data structure 15 304.

20 *Sub B32* Data structure 304 also includes target analysis where desired target time repair values are compared against the actual time expended to repair a vehicle. In the preferred embodiment, the target analysis includes the number of labor hours sold, the labor hours divided by five hours, actual business days expended to repair the vehicle, and a cycle time efficiency metric. For example, if the number of labor hours sold to complete a vehicle repair process was 30 hours, the labor hours divided by 5 value

33  
B would be 6. If the actual days expended was 7 instead of the targeted six days, then the cycle time efficiency would indicate that 1 day had been lost .

Sub 33  
5 Data structure 304 includes the insurance company being associated with a vehicle repair in order to capture delays associated with an insurance company. For example, if an inordinate number of "11" insurance approval delay codes have been entered in data structure 304 for a particular insurance company, then the owner of the vehicle can be told that the reason for the delay was not the repair shop, but rather the insurance company that the vehicle's owner presently uses and that this insurance company is chronically late inspecting damaged vehicles.

Sub 33  
15 Figure 6 provides an example of an user entering and viewing the detailed information used to generate sales and marketing summary information. In particular, Figure 6 is associated with the selling and sources of the business. The present invention provides multiple areas in this category for the user to provide information about their business. For example, the present invention asks for information related to a customer's first impression of the user's facility. A user clicks upon button 350 via a pointing device (such as a computer mouse) to see more detailed questions asked by the present invention as well as have access to an action planner for adding particular checklist items to the user's business plan. Upon clicking button 350, the user in this example is taken to the computer screen depicted in Figure 7.

20 With respect to Figure 7, more detailed questions are asked about the user's facility. For example, regarding the customer's first impression of the facility, more



5

15

Figure 9 shows the same computer screen as Figure 7, however populated with information supplied by the user. The results of the responses supplied by the user on Figure 9 shows the strength indicator relative to the customer's first impression of your facility by reference numeral 384. In this example, the user has supplied other information that the present invention is used to generate the strength indicators for the remaining business aspects in Figure 9.

Figures 10a and 10b show another example of the present invention acquiring data in order to provide business analysis to the user. The computer screen depicted in Figures 10a and 10b shows a customer data entry form for providing detailed information about the user as well as sales information and how many technicians work; on which days, for how many hours, and for which shift. This information is aggregated by the present invention and shown to the user in the succinct format depicted in Figure 4.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention and all such modifications that would be obvious to one skilled in the art are intended to be included within the scope of the following claims. For example, the present invention is not limited to vehicle collision repair shops, but extends to other multi-process vehicle operations or multi-process non-vehicle operations, such as but not limited to vehicle sales operations. For example, a vehicle

sales operation shop uses the present invention to analyze its business relative to performance, priorities, projections, and production workforce shift profiles.

006250" 21620960